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भारतीय मानक
Indian Standard

वस्त्र रंजक सामग्री — एग्ज़्हौस्ट रंगाई द्वारा पॉलिएस्टर के लिये डिस्पर्स रंजको की तीव्रता के निर्धारण की विधि

(पहला पुनरीक्षण)

Textile Dyestuffs — Method for Determination of Strength of Disperse Dyes for Polyester by Exhaust Dyeing

(First Revision)

ICS 59.040

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भारतीय मानक ब्यूरो
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Textile Speciality Chemicals and Dyestuffs Sectional Committee, TXD 07

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Textile Speciality Chemicals and Dyestuffs Sectional Committee had been approved by the Textiles Division Council.

Disperse dyes are marketed in a large number of varieties and even as mixtures in powder or paste form with different strengths. These dyes are mainly used for colouring hydrophobic fibres, such as cellulose acetate, triacetate, polyamide, polyester, polyacrylonitrile, etc. These have become especially important for polyester fibre which is widely used as a component of blends with cotton, wool or any other manmade fibre. The method laid down in this standard for determining the strength of dyestuff against a mutually accepted standard would be useful for assessing both strength and shade of disperse dyes for polyester.

The method prescribed in this standard is a general method and wherever special instructions are given by the manufacturers, these should be followed while carrying out the dyeings of the dyestuffs. In order to compare the strength of the dyestuff under test and the standard dyestuff, dyeing of two standard depths are recommended as given in Annex A.

Strength of disperse dyes is also determined by screen printing method (*see* IS 11635 : 1986 ‘Method for determination of strength of disperse dyes for polyester by screen printing’)

This standard was first published in 1987. The first revision has been made in the light of experience gained since its publication and to incorporate the following major changes:

a) Title of the standard has been modified;
b) Grade and purity of chemicals used have been specified;
c) Sampling clause has been modified; and
d) References to Indian Standard have been updated.

The composition of the Committee responsible for the formulation of this standard is given in Annex B.

In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’.

Indian Standard

TEXTILE DYESTUFFS — METHOD FOR DETERMINATION OF STRENGTH OFDISPERSE DYES FOR POLYESTER BY EXHAUST DYEING

(First Revision)

1 SCOPE

This standard prescribes a method for evaluating the strength of disperse dyes for polyester by exhaust dyeing.

2 REFERENCES

The following standard contains provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the edition indicated was valid. All standards are subject to revision and parties to agreements based on this standard are encouragedto investigate the possibility of applying the most recent edition of the standard indicated below.

IS No.	*Title*
1070 : 1992	Reagent grade water – Specification (*third revision*)
1919 : 1982	Specification for sodium hydrosulphite (*first revision*)
11220 : 1994	Method for determination of colour fastness of disperse dyes on polyester fabrics to carbonization

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply:

3.1 Depth of Shade — It is the amount of dyestuff in g in the dyebath per 100 g of the textilematerial to be dyed, expressed as a percentage.

3.2 Strength of Dyestuff — It is the actual dye content in g per 100 g of the sample of dyestuffexpressed as a percentage; assuming strength of the standard dyestuff to be 100 percent.

3.3 Liquor Ratio — The ratio of the mass of the material to be dyed to the mass of the liquor(dye solution or dye bath) in which the material is to be dyed.

4 STANDARD DYESTUFF

4.1 The standard dyestuff against which the strength of dyestuff under test is evaluated, shall beas agreed to between the buyer and the seller.

5 SAMPLING

5.1 Lot — All the containers of the same dye and the same strength delivered to a buyer against adispatch note shall constitute a lot.

5.2 Unless otherwise agreed to between the buyer and the seller the number of containers to beselected at random from a lot shall be in accordance with Table 1.

5.3 If the dye is marketed in powder form, draw from each container as selected in **5.2** small quantities of the dye by a suitable sampling instrument from at least three different parts and mix them thoroughly to get a composite sample weighing about 20 g. This shall constitute the test sample.

5.4 For dyes marketed in liquid emulsion or paste form, shake each container as selected in **5.2** thoroughly so as to homogenize the dye dispersion and then draw the test sample as given in **5.3**.

Table 1 Sample Size

(*Clause* 5.2)

Lot Size (1)	Sample Size (2)
i) 2 to 15	2
ii) 16 to 25	3
iii) 26 to 50	4
iv) 51 to 100	5
v) 101 to 150	6
vi) 151 to 300	7
vii) 301 and above	8

6 APPARATUS

6.1 High Temperature Bomb/Beaker Dyeing Machine (Laboratory Type) — Consisting of a number of bombs/beakers made of thick stainless steel and provided with a rotating mechanism to rotate these beakers/bombs in forward or backward direction in glycerine bath. The machine shall be provided with electric heaters (with cut-off system) to heat the glycerine bath gradually up to 132 ± 2°C at a rate of 1° - 2°C per minute. The machine should also be provided with a running tap water circulation system to cool the bombs/beakers.

> NOTE — Any other machine giving identical and reproducible results may also be used.

6.2 Graduated Pipette — with an accuracy up to 0.1 ml.

6.3 Volumetric Flask — 500 ml capacity and accuracy up to 1 ml.

6.4 *p*H Meter

6.5 Weighing Balance — with accuracy up to 1 mg.

6.6 Glass Rod — for preparing dispersion of dye.

6.7 Comb — for combing the dyed hanks.

5 REAGENTS

7.0 Unless otherwise specified analytical reagent grade chemicals with 99.0 percent purity shall be employed in tests and distilled water (*see* IS 1070) shall be used where the use of water as reagent is intended.

7.1 Distilled Water — *see* IS 1070.

7.2 A Suitable Dispersing Agent — Stable at high temperature up to 132 + 2°C.

7.3 Acetic Acid — 30 percent (*m/v*).

7.4 Sodium Hydroxide Flakes

7.5 Sodium Hydrosulphite Powder — Conforming to IS 1919.

7.6 An appropriate number of hanks of well scoured, uniform, 100 percent polyester spun yarnfrom the same lot, each weighing 5.00 ± 0.02 g and free from optical brightening agents.

> NOTE — For blended yarn, the hanks may be carbonized before dyeing according to the methodgiven in IS 11220.

8 EVALUATION ON STRENGTH OF DYESTUFF

8.1 Procedure

8.1.1 Prepare stock dispersion of the standard dyestuff and the dyestuff under test separately asgiven below:

Sprinkle 5.0 g of the standard dyestuff over 15-20 times the quantity of distilled water at 40°Cunder constant stirring and make up to 100 ml using distilled water.

8.1.2 Take the required volume of the stock dispersion of the standard dyestuff as per the depthrecommended in Annex A. It is calculated as follows:

Volume of stock dispersion (ml)

$$= \frac{\text{Recommended percent depth} \times m}{\text{Percent strength of stock dispersion}}$$

where m is the mass of each hank of polyester yarn (*see* **7.6**).

8.1.3 Prepare as follows six dyebaths of the standard dyestuff, three each for the lower and higherrecommended standard depths such that one dyebath has concentration as given in Annex A and other two differ from this value by 5 percent, one on lower side and the other on higher side. For example, in case of 0.5 percent standard depth, three dyebaths of 0.475, 0.500 and 0.525 percent concentration shall be prepared. Add the required volume of stock dispersion as in **8.1.2** for the depths of shades as recommended in Annex A in the bombs/beakers of the high temperature dyeing machine set with 0.5 g/l of dispersing agent and 0.5 g/l of acetic acid (30 percent). Adjust the *p*H of each dyebath to 5.0 ± 0.2 and make the volume up to 100 ml per dyebath with distilled water to give a liquor ratio of 1:20.

8.1.4 Prepare suitable number of dyebaths of the dyestuff under test for each standard depth as recommended in Annex A such that each differs in concentration from the other by 5 percent of the value specified in Annex A. For example, in case of 0.5 percent standard depth, prepare required number of dyebaths of 0.425, 0.450, 0.475 0.500, 0.525, 0.550 and 0.575 percent concentration, etc, similarly as given in **8.1.3**.

8.1.5 Take required number of hanks of well scoured polyester yarn (*see* **7.6**) and treat them in boiling water for 10 minutes. Squeeze them individually so that pick up for each hank is approximately cent percent. Cool the hanks and put in the separate dyebaths already prepared as in **8.1.3** and **8.1.4**. Close the bombs/beakers of the high temperature dyeing machine.

8.1.6 Start each dyeing at 60°C and raise the temperature gradually to 132 ± 2°C in about 40 minutes at the rate of l-2°C per minute. Continue dyeing at 132 ± 2°C for 60 minutes more. Cool the bombs/beakers under tap water on the machine itself and take them out for opening.

8.1.7 Rinse the dyed hanks in distilled water and treat each dyed hank separately in a bath containing 2 g/l sodium hydroxide and s2 g/l at 60 -70°C for 15-20 min at material to liquor ratio of 1:20.

8.1.8 Wash the after-treated hanks in distilled water and treat them separately in fresh baths containing 0.5-1 ml/l glacial acetic acid at room temperature for about 15-20 minutes.

6.1.9 Finally rinse all the hanks thoroughly and dry them in air at a temperature not exceeding 60°C.

6.1.10 Select two dyed hanks of the dyestuff under test which exactly match with the dyed hanks of the standard dyestuff. Note the percentage depths of shade of the dyestuff under test which exactly match with the recommended depths of standard dyestuff (*see* Notes 1, 2 and 3).

NOTES

1. The dyed hanks should be laid side by side in the same plane and oriented in the same direction. They should be combed to uniform thickness to avoid the effects of the backing on the appearance. Matching should be done on a white background in north skylight, if possible. The consistency in strength variation of different dyeings of standard dyestuff and the dyestuff under test should be observed. If the strength variation between the two consecutive dyeings is not constant the dyeings should be repeated. In all cases, ± 5 percent deviation in dye strength is taken for accurate strength assessment in the dye trials.
2. Before comparing the dyed specimens, it should be ensured that the dyeings are uniform and free from dyeing defects, otherwise dyeings should be repeated.
3. In case of dispute due to tonal deviations, spectrophotometer may be used to set right any doubt.

9 CALCULATIONS

9.1 Calculate the strength of dyestuff under test for both recommended depths of dyestuff by the following formula:

$$S = \frac{A}{B} \times 100$$

where

S = strength of dyestuff under test in percentage,

A = percentage depth of shade of standard dyestuff, and

B = percentage depth of shade of the dyestuff under test matching with A.

9.2 Find out the average of the two values of S as obtained in **9.1**.

10 REPORT

Report the value obtained in **9.2** as strength of dyestuff under test as percentage.

ANNEX A

(*Foreword and Clauses* 8.1.2, 8.1.3 *and* 8.1.4)

RECOMMENDED STANDARD DEPTHS FOR EVALUATING STRENGTH OF DYESTUFF

Sl No. (1)	**Hue of Dyestuff** (2)	**Recommended Standard Depth of Shade** (g of dye per 100 g of fibre) (3)
i)	Yellow, orange, scarlet red and blue (excluding navy blue and turqoise blue)	0.5 and 1.5 or 2.0
ii)	Violet	0.3 and 1.0
iii)	Turqoise blue	1.0 and 4.0
iv)	Navy blue	2.0 and 6.0
v)	Blue	2.0 and 8.0

ANNEX B
(*Foreword*)

COMMITTEE COMPOSITION

Textile Speciality Chemicals and Dyestuffs Sectional Committee,
TXD 07

Organization	*Representative(s)*
Department for Jute and Fibre Technology Institute of Jute Technology, University of Calcutta, Kolkata	PROF A. K. SAMANTA (***Chairman***)
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Ama Herbals Laboratories Pvt Ltd, Lucknow	SHRI Y. A. SHAH
Archroma India Pvt Limited, Mumbai	SHRI RAJESH RAMAMURTHY SHRI ASHIM GHOSH (*Alternate*)
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The Bombay Textile Research Association, Mumbai	Dr Padma S. Vankar Shri M. P. Sathianarayanan (*Alternate*)
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The Synthetic and Art Silk Mills Research Association, Mumbai	Shrimati (Dr) Manisha Mathur Shrimati Ashwini Sudam (*Alternate*)
U P Textile Technology Institute, Kanpur	Dr Arun Patra
Wool Research Association, Thane	Shrimati Smita Bait Shrimati (Dr) Mrinal Choudhari (*Alternate*)
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Review of Indian Standards

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